Claims

1. A detection device for discriminating between different materials comprising an optical system having at least one dielectric lens element and a receive element characterised in that the receive element is sensitive to millimetre-wave radiation, the optical system is arranged to focus incident energy from a scene onto the receive element, and the device is adapted to measure the power of a received signal at different times and further adapted to be able to make measurements from different parts of the scene, and provide an indication based on the measurements.

2. A detection device as claimed in claim 2 wherein the device is adapted to measure radiation at a plurality of polarisations from the scene.

3. A detection device as claimed in claim 2 wherein means for altering the polarisation of the radiation within the device is incorporated in the optical system.

4. A detection device as claimed in claim 3 wherein the receive element is sensitive to a first polarisation state, and the means for altering the polarisation periodically alters the polarisation of radiation orthogonal to the first polarisation state such that it is in the first polarisation state.

5. A detection device as claimed in claim 4 wherein the polarity changing means incorporates a fixed quarter-wave plate and at least one moveable quarter-wave plate arranged such that
the position of the (at least one) moveable quarter-wave plate determines which polarisation of the radiation incident upon the optical system will be detectable by the receive element.

6. A detection device as claimed in claim 5 wherein the quarter-wave plates are fitted with polarising elements.

7. A detection device as claimed in claim 5 or claim 6 wherein the at least one moveable quarter-wave plate is rotatably mounted such that radiation incident upon the optical system may be directed through the at least one moveable quarter-wave plate, and at different angular positions the radiation passing through the at least one quarter wave plate sees orthogonal fast axes.

8. A detection device as claimed in any of claims 5 to 7 wherein the quarter-wave plates comprise meanderline structures.

9. A detection device as claimed in any of the above claims wherein the device includes an internal millimetre-wave source arranged to periodically provide a reference signal to the receive element.

10. A detection device as claimed in claim 9 wherein the internal millimetre-wave source comprises a radiation absorbent material rotatably mounted such that it periodically interrupts the path of the radiation received by the optical system.

11. A detection device as claimed in any of the above claims wherein the device is arranged to change the direction of arrival of the incoming radiation with time.

12. A detection device as claimed in claim 11 wherein the device is arranged to make successive measurements at orthogonal polarisations.

13. A detection device as claimed in claim 12 wherein the device is arranged to measure successive measurements in a particular direction at orthogonal polarisations.

14. A detection device as claimed in any of claims 11, 12 or 13 wherein a refractive element is mounted in the path of the received radiation, the refractive element being rotatable such that different rotational positions result in energy from differing directions being passed to the receive element.

15. A detection device as claimed in claim 14 wherein the refractive element comprises a prism.

16. A detection device as claimed in claim 14 wherein the refractive element comprises at least one segment of a cone.

17. A detection device as claimed in claim 14 wherein the refractive element comprises a parallel faced slab.

18. A detection device as claimed in any of claims 1 to 17 wherein the device is arranged to change the beamwidth of a receive beam with time.

19. A detection device as claimed in claim 18 wherein the beamwidth is arranged to be changed by means of changing the focal length of one or more lens elements making up the optical system.

20. A detection device as claimed in claim 19 wherein the means for changing the focal length of one or more of the lens elements comprises apparatus for switching different lenses into the path of the received radiation.

21. A detection device as claimed in any of claims 1 to 20 wherein the optical system comprises an afocal telescope.

22. A method of detecting objects present in a scene by means of receiving millimetre wave radiation from the scene, characterised in that:

a first measurement is made of radiation from a first part of the scene;

a further measurement is made of radiation from a second part of the scene;

an indication is provided if characteristics of the first measurement are different to characteristics of the further measurement.

23. A method as claimed in claim 22 wherein an observed characteristic is the received power level.

24. A method as claimed in claim 23 wherein power levels at orthogonal polarisations are used as an observed characteristic.

25. A method as claimed in any of claims 22 to 24 wherein the incoming radiation is focused onto a receive element by means of an optical system.

26. A method as claimed in claim 25 wherein the optical system incorporates scanning means to change with time the direction of arrival of the incoming radiation such that measurements from different parts of the scene are taken.

27. A method as claimed in claims 25 or 26 wherein the receive element is sensitive to the polarisation of the incoming radiation, and means is incorporated for altering the polarisation of incoming radiation.